405 with on-chip masked ROM, RAM and built-in timers, ports, analog to digital converters and a serial interface 406. Thus, the microprocessor functions as a microcontroller and as an interface for communicating data and control signals to and from the base module 316. In addition to the on-chip memory capacity, an external ROM 407 and an external RAM may be provided for additional data processing and communication capacity. Display controller and driver circuits 409 may be multi-chip circuits or may be integrated into a single device to drive the described LCD screen 410. A typical scanner interface 415 is coupled to a 9 pin connector 416, such as the referred to D-subminiature connector which may couple a laser scanner or CCD scanner to the base module 316 for data collection.

The data and communication module 400 is of particular interest in that an improved interfacing may be obtained by coupling communication between the data and communication module 400 and the base module 316 through a microprocessor 425, such as, for example, an 80C51 microprocessor circuit. Typical on board ROM allows the microprocessor to be programmed to interact with a number of devices in accordance with the stored program. The microprocessor interacts with an interface circuit 426 which may be an analog or mixed analog and digital interface circuit. The program for interacting with the interface circuit 426 may also be stored within a ROM of the interface circuit 426. The interface circuit 426 is coupled to a transceiver module 428. The microprocessor 425 may also be coupled directly to a data collection interface 429 to receive data from a scanner for reading any number of different bar codes or for providing input data from other external sources. The operation of the microprocessor 425 for coupling data to the base module 316 allows various input patterns to be processed by any of specific operational protocols controlled by the microprocessor 425, such that the data input from the data collection circuit 429 can be made the same from any of a number of devices. Also, with respect to the operation of the transceiver, in that the program for operating the microprocessor 425 may include particular address codes for data retrieval and data communication via the transceiver, the data sent via a data and control bus between the microprocessors 425 and 404 can emulate a uniform data transfer protocol to the base module 316. The simplification resulting from the microprocessor 425 increases the number of communications devices that may be represented by the data communication transceiver circuit or module 428.

Referring now to FIG. 18, the base module 316 is shown as being coupled to a different data and communications module designated generally by the numeral 430 in which the interface circuit 426 shown in FIG. 16 has been replaced with an interface circuit 432 and the transceiver 433 coupled to the interface circuit 432. The transceiver 433 may, for example, be a complex radio, such as a spread spectrum radio in lieu of an FM transceiver, such as may have been represented by the block identified at 429 in FIG. 17. However, the program function represented by the interface circuit 432 and interacting with the microprocessor permits the interactive control and data stream between the base module 316 and the data and communication module 430 to be emulated to appear to the base module 316 as being the same as the simple FM transceiver module.

PREFERRED RF DATA TERMINAL-SCANNER CONFIGURATION

The RF data terminal 118 as shown in FIGS. 7, 8, and 10 generally may provide the features disclosed in U.S. Pat. No. 4,910,794 issued Mar. 20, 1990 and European Published Patent Application EP/O353759/A2 dated Feb. 7, 1990, and described in International Application No. PCT/US90/03282 published Dec. 27, 1990 as International Publication No. WO90/16033. The terminal will run application programs downloaded to it, or permanently stored in it, or combinations of both.

When the radio module 118, FIG. 7, is added to the terminal 11, communication is expanded from direct-wired telecommunication hookups to include real time on-line communication with a host (e.g. a shared data base, applications, etc.). Where the peripheral control card of FIG. 9 is used for the terminal, the radio module itself in the preferred embodiment contains not only the transmitter, receiver, associated level adjusts and the scanner connector 119 direct wired back to the control microprocessor of terminal 11, but also the components as illustrated in FIG. 10.

The scanner module 313 is treated as an add-on peripheral to terminal 311, governed by the control microprocessor 212, as indicated in FIG. 9.

The terminal 11 may be fitted into a handle such as is disclosed in PCT/US90/03282 and such handle may contain additional batteries for extended operation and to lower the center of gravity of the device. An option would be to remove the batteries of the terminal to further lower the center of gravity of the device.

The antenna 341 is offset laterally from its connector (FIG. 16) to avoid scanner/antenna electromagnetic interference issues, and may be formed with a right angle bend as shown in FIG. 16. The length of the antenna may be adjusted to various desired angular positions besides the horizontal disposition shown in FIG. 16. For example, antenna element may be disposed vertically (as the data terminal is viewed in FIG. 16).

The terminal control microprocessor FIG. 9, controls the supply of battery power to the RF module.

The signal levels transmitted at the interface between the low pass filters 222, 226, of the terminal peripheral board 26, FIG. 9, and the transmit and receive level adjusts 204, 208, of the RF module, e.g., if used for an RF module, may be standardized to allow terminals and modules to be assembled independently, and then mated in final production, and interchanged in the field, without re-tuning in either case.

The base-band processing circuitry could be located in the RF module as in FIG. 9, and in this case digital signals would be transmitted at the interface between the terminal and the scanner module.

The reference to the particular microprocessor circuits should not be considered limiting to the scope of the invention. The combination of two microprocessor interacting with each other, each controlling the environment of a respective one of two sub-modules such as the base module and the data and communication module permits an increased number of different components and functions within the data system. Likewise, it should also be noted that user interface means could include a voice activated user interface, retina activated user interface, or the like.

Appendix A (not printed here, but being available in the application file) is a copy of an "RT3310 and RT3410 Radio Data Terminals" brochure wherein certain features of the present invention are further described.

Appendix B (not printed here, but being available in the application file) contains pertinent portions of the assignee's NORAND CORPORATION, "3000 Series Radio Data Ter-